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BISON REMAINS FROM NEW ENGLAND

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As long ago as 1849, Sir Charles Lyell published the discovery of supposed bison teeth from a bank of glacial clay at Gardiner, Maine. In his book recounting his second visit to the United States, Lyell says (Second visit to the United States, 1849, vol. 1, pp. 43, 44) that the teeth were identified as those of bison by Sir Richard Owen, and that they had been found in association with the shells of marine mollusks identical with recent species. Three of the teeth eventually passed from their original owner, a Mrs. Frederic Allen, to the Bowdoin College Museum, and one was given to the Boston Society of Natural History, in whose possession it still remains. In his memoir on the American bisons Dr. J. A. Allen reviews at some length the history of these teeth and shows (Mem. Mus. Comp. Zoöl., 1876, vol. 4, no. 10, p. 88-91) that Lyell had not himself seen the specimens in place, that their exact position in the clay bank was doubtful, and that Professor Owen disclaimed all responsibility for their identification. After a minute comparison, Doctor Allen was unable to distinguish them in any way from those of the domestic ox, to which he therefore referred them. There seems no reason to question this determination and it appears likely that the teeth had reached their position in the clay bank in some secondary way.

There is thus at the present time no proof that the bison ever occurred within the present limits of New England. Moreover the careful examination of accounts by early travellers as reviewed in Doctor Allen's memoir, indicates that within historic times and probably for a long period anterior to the coming of white men, the bison ranged no farther east than the present west-central Pennsylvania and the southeastern end of Lake Erie in what is now the extreme western corner of New York State.

It is therefore of interest to record the discovery of a fragment of the maxilla with two milk teeth of a bison at Orleans, on Cape Cod, Massachusetts. It is exceedingly fortunate that this discovery was made by a professional geologist, Dr. A. W. Grabau, whose manuscript note made at the time, now some twenty years ago, accompanies the specimen. From this it appears that the specimen was discovered wholly embedded in till about halfway up on a section of a glacial moraine, situated on Town Cove, and about seventy or eighty feet high. The moraine consisted of "till with boulders much rain worn." Associated with the specimen in the till were many fragments of the marine mollusk *Venus*. Doctor Grabau has presented the specimen to the Boston Society of Natural History in whose collection it has since remained. It was brought to my notice during a recent revision of the Society's Pleistocene fossils and was still largely embedded in glacial sand. On carefully cleaning this away, the teeth were seen to be the second and third milk molars (dp^3 , dp^4) of the left side, quite unworn and perfectly preserved, while fragments of an unerupted first permanent molar were also disclosed.

The manner of its occurrence suggests that the bison calf from which the fragment came had either met its end while wandering on the moraine during the formation process or more likely had lived during a previous interglacial stage and its scattered bones had been scraped up by a succeeding glacier during the time of the last or Wisconsin ice-sheet. That the teeth are wholly unbroken indicates that they suffered little from rolling or crushing. Presumably, the animal from which they came must have lived in the so-called Peorian interglacial stage just preceding the last advance of the ice-sheet.

From extensive researches on the mammals of the North American Pleistocene, Dr. O. P. Hay (Smithson. Misc. Coll., 1912, vol. 59, no. 20, p. 13) concludes that of the several species of *Bison* known to have existed in America, all "except *Bison bison* had become extinct before the Wisconsin ice-sheet had retired from its southernmost limit." In view of this conclusion and of the precise agreement of the specimen here recorded, with the corresponding teeth of *Bison bison*, I have referred it to the latter species. The occurrence of a bison in eastern Massachusetts in the latter Pleistocene times not only indicates a former range much farther to the eastward of its known limits within the historic period, but presupposes as well a certain amount of open grasslands. It was perchance an inhabitant of the ancient coastal-plain area, relics of whose fauna and flora are still preserved in isolated colonies along the New England and adjacent coasts.

Since the identification of this important specimen rests solely on the second and third upper milk molars, it may be well to point out some of the details of structure that distinguish these teeth in *Bison bison* from the corresponding teeth of the domestic ox, *Bos taurus*, for at first sight the teeth of the two species are very similar in general appearance. The second milk molar (dp^3), on account of its more complicated structure, is of greater diagnostic value than either of the others. It is (1) slightly longer than in the domestic calf in four out of five specimens examined. (2) At the anterior outer corner there are at the summit of the crown, two very short crests embracing a shallow depression

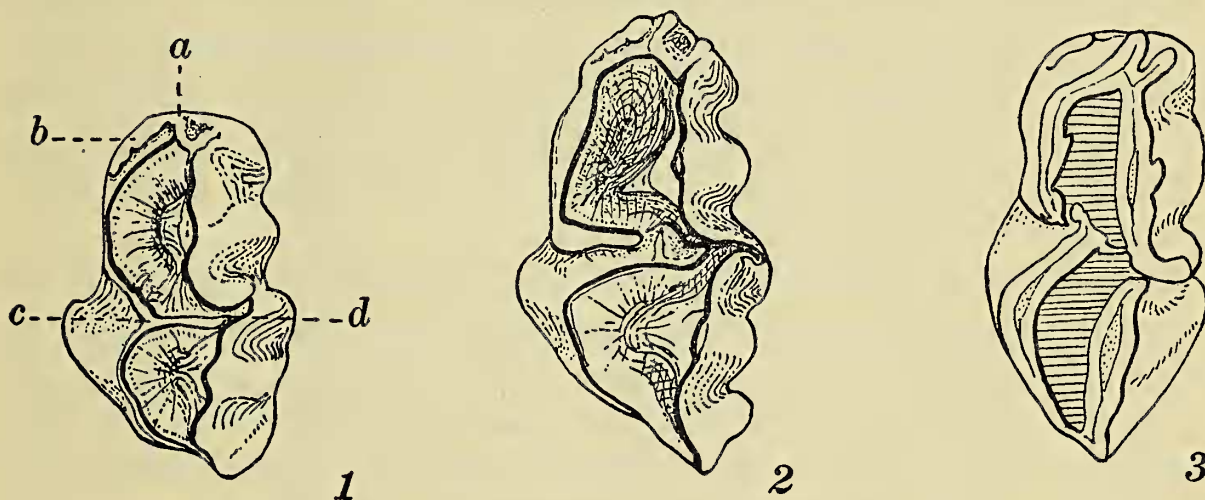


FIG. 1. DOMESTIC CALF, *Bos taurus*

Second upper milk molar (dp^3) of left side, crown view (M. C. Z. 86)

FIG. 2. AMERICAN BISON, *Bison bison*

The same tooth of the Cape Cod specimen, crown view

FIG. 3. AMERICAN BISON, *Bison bison*

Same tooth, slightly worn, in a specimen from Kansas (M. C. Z. 90)

(fig. 1, *a*) in the domestic calf, whereas in the bison (fig. 2) these crests are much more prominent and are separated by a deeper cleft. Both species exhibit variation in the formation of these cusplets. In one domestic calf (M.C.Z. 86) they are practically confluent, without a sign of the dividing cleft; in another the cleft is a mere pit. In *Bison bison* on the contrary they are much better developed and in a slightly worn milk tooth (fig. 3) may even appear as two small lobes. (3) In the domestic calf the antero-internal cingulum cusp (fig. 1, *b*) is much better developed than in the calf bison, forming a narrow and evenly ascending ridge from the base of the tooth to the summit of the crown,

where it fuses with the inner of the two cusplets just described. In the calf bison on the contrary, its inception is much more abrupt from well up on the front side of the tooth and it is usually separated by a deep cleft from the external cusplets. In one specimen (M.C.Z. 112) it is so reduced as to be practically lacking but is represented by two or three minute denticles. (4) A fourth point of distinction is that while in the domestic calf the summit of the anterior crescent is rather evenly confluent with that of the posterior (fig. 1, *c*) in the calf bison the two crescents are usually separated by a distinct notch which in the slightly worn tooth (fig. 3) becomes less evident. Finally (5) the anterior horn of the posterior crescent, when unworn, is seen to extend into the peak of the angle formed by the two external lophs (fig. 1, *d*) whereas in the bison it abuts against the posterior inner wall of the anterior loph, and, as shown in the slightly worn tooth (fig. 3), fuses with it at a short distance below the summit. This feature is also characteristic of the third milk molar (*dp*⁴).

The following measurements of the two posterior milk molars in domestic calves and calves of the American bison bring out the slightly greater size of these teeth in the latter. The Cape Cod bison teeth are the first listed among the bison. It should be added also, that the teeth of bison no. 112 of the table, though as small as those of a domestic calf, in other respects show the characteristic form of the bison teeth to an extreme degree.

Milk teeth of Bos taurus

	COMBINED LENGTH OF CROWNS <i>dp</i> ³⁻⁴	CROWN OF <i>dp</i> ³	CROWN OF <i>dp</i> ⁴
	<i>mm.</i>		
M. C. Z. 85	50	26	27
M. C. Z. 86	50	26	27
M. C. Z. 1954.....	51	26.5	28
M. C. Z. 9408.....	50	26	27

Milk teeth of Bison bison

B. S. N. H.....	53.5	28.5	28.5
M. C. Z. 89	53	28.5	29
M. C. Z. 90	52.6	27.7	27.6
M. C. Z. 112	50.5	26	27.2
M. C. Z. 1711.....	52.5	28.2	29

Acknowledgments are due the Museum of Comparative Zoölogy for permission to study and record the excellent series of skulls noted above.